

**Serial No.: 08/889,440****Docket No.: 21.1837/HBW****REMARKS****Introduction**

Reconsideration and allowance of the subject application are respectfully requested. Claims 1-32 remain pending.

**The Specification**

The specification has been reviewed and minor informalities therein corrected, without the introduction of new matter. Thus, the Examiner's objection thereto is overcome and withdrawal of same is respectfully requested.

**The Section 101 Rejection**

The rejection of claims 20-22 under 35 U.S.C. § 101 is respectfully traversed. The claims, as alleged by the Examiner, are not drawn to non-statutory subject matter, but instead are fully in compliance with § 101. The Examiner asserts that these claims claim nothing more than an algorithm. However, according to the doctrine of State Street Bank & Trust Co. v. Signature Financial Group Inc., 47 USPQ2d 1596, the Examiner must look the results produced rather than the steps of the claimed method. "[T]he mere fact that a claimed invention involves inputting numbers, calculating numbers, outputting numbers, and storing numbers, in and of itself, would not render it nonstatutory subject matter, unless, of course, its operation does not produce a "useful, concrete and tangible result." State Street at 1602, citing In re Alappat, 33 F.3d 1526, 1544 (Fed. Cir. 1994) (in banc).

In the case of present claim 20, the step of computing motion of a particle is surely a transformational step in that it transforms a purely mathematical claim into one that produces tangible results. This computing step is done to simulate phenomena of the combined particle. Thus, the invention recited in present claim 20 does indeed produce a concrete, useful result as mandated by State Street. Likewise, claim 22 also recites a step of

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computing motion of a particle, this step also being the transformational step required by State Street.

Thus, the § 101 rejection is overcome and withdrawal of same is respectfully requested.

### **The Section 112, First Paragraph Rejections**

The rejection of claims 20-22 under 35 U.S.C. § 112, first paragraph for lacking utility also is respectfully traversed. Since the claims are statutory, by definition they must also be useful. The computation of particle motion is a useful step and may be used for many purposes. Thus, this rejection is likewise rendered moot.

The rejection of claims 6, 8, 9, 27, 29, and 31 under 35 U.S.C. § 112, first paragraph is also respectfully traversed.

The present invention is directed for use with atomic scale (or larger/heavier) particles, in other words mass points, and not electrons. Within the Born-Oppenheimer approximation, it is possible to express the Hamiltonian of a system as a function of the nuclear variable, with the rapid motion of electrons being averaged out.

The specification discloses on page 10 that each particle as a simulation object is composed of, for example, a substrate particle and an adsorbate particle. It is further disclosed that the substrate particle includes (1) a fixed particle, which does not change its position (2) a temperature control particle, which has a constant temperature, and (3) a free particle having no restriction on change of position or temperature. The specification also discloses on page 10 that the substrate particle may undergo some movement at the molecular level. This movement is the vibrations of the atoms or molecules around their equilibrium positions. The positions form lattice structures in the crystal phase, but in an amorphous phase form a liquid-like structure. In addition, the database file (see page 9) are not restricted to crystal structures. The "crystal structure database" file, which consists of a set of atoms, and the "molecular crystal database" file, which consists of a set of atoms and

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molecules, include coordinates, i.e. structure information. According to the coordinates included therein, the structures can be crystal or amorphous. The substrate structures are invoked from the database files. Therefore, the substrate particles can form not only a crystal structure but also an amorphous structure.

This disclosure fully supports claims 6, 8, and 29, which recite that each individual particle is formed of smaller particles, since the specification clearly describes that each particle as a simulation object is composed of, for example, a substrate particle and an adsorbate particle.

As per the Examiner's question regarding claim 27 raised in paragraph 10 of the Official Action, Applicants respond as follows.

The substrate particle is not a part of the lattice structure. The Examiner's comment that "by definition a substrate particle is tied to a lattice is pure fiction. Applicants would like to see such a definition if one exists, as the Applicants disagree with this statement by the Examiner. As explained above, a substrate particle can form both a crystal structure and an amorphous structure. Their equilibrium positions are decided by the equilibrium structure, and they vibrate around the position via their kinetic energies and interactions with surrounding particles. Thus, the substrate particle is not tied to a lattice, contrary to the Examiner's definition. Both the "temperature control particle" and the "free particle" can move around their equilibrium position. And, in addition, the "temperature control particle" undergoes velocity changes to control temperature while the "free particle" does not.

As per claims 9 and 31, these claims have been amended above to more accurately recite the present invention, and thus, the rejection of these claims is likewise overcome and withdrawal of same is respectfully requested.

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### **The Section 112, Second Paragraph Rejection**

The rejection of claims 1-3, 5-6, 8-10, 12, 15-18, 20-23, and 29 under 35 U.S.C. § 112, second paragraph is believed overcome by the amendments above and the following remarks.

With respect to claims 1 and 2, it is Applicants' intent for each combined particle to be defined as including both substrate and adsorbate particles. This is now clearly recited in the claims.

As to the Examiner's rejection of claim 29 in paragraph 15 of the Official Action, the Examiner questions as to what the adsorbate particle is made of. The "adsorbate particle" recited in claim 29 is, for example, an isolated atom, an isolated molecule, or a cluster of molecules which consists of atoms or molecules. "Smaller particles" are components of each adsorbate particle. That is, they are atoms or other mass points, which, for example, represent a set of atoms by one mass point.

With respect to the Examiner's questions on the top of page 6 of the Official Action, Applicants comment as follows. First, a combined particle is formed of both substrate particles and adsorbate particles, not simply adsorbate particles as advocated by the Examiner. The combination of a substrate particle and an adsorbate particle to form a combined particle does not mean that the particles are interacting with one another. Rather, this is meant as a fictitious representation and is not intended as a physical criterion.

The Examiner is correct in his belief that the use of corresponding in claims 10, 12, 22, and 32 means that each individual particle has its own emission source. That is, if there are 50 particles generated, there are 50 such sources. The 50 particles do not have the same emission source.

As described in the application on page 16, an operator can designate only one adsorbate particle emission source as a region. That is, the particles have the common emission source region. Moreover, for the actual emission source of each adsorbate particle, the specific positioning in the designated region is determined using random numbers. That

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is, is there are 50 particles generated, there are 50 emission source positions. These positions should be interpreted as the sources recited in the rejected claims.

Thus, the remarks above overcome the § 112, second paragraph rejection and withdrawal of same is respectfully requested.

### **The Section 103 Rejection**

The rejection of claim 1 under 35 U.S.C. § 103 as being unpatentable over Misaka et al. in view of Baumann et al. is respectfully traversed. The issues raised by the Examiner have been clarified above, and the claims are believed to be in condition for allowance.

In response to the Examiner's comments in paragraph 20 of the Official Action concerning the use of the word combined in the claims without proper support in the specification, Applicants comment as follows. A combined particle is defined on page 3, lines 14-16 of the subject application as referring to a particle formed of a combination of individual atoms and/or molecules. Also on page 3, a combined particle is defined as "formed, for example, of substrate particles and adsorbate particles, where each of the individual particles is an adsorbate particle." On page 4, a combined particle is referred to as "formed of individual particles, where each individual particle has a corresponding emission source." The claims recite, for example claim 5, that the combined particle is formed of a first type of particle and a second type of particle. The first type of particle refers to the substrate particle and the second type of particle refers to the adsorbate particle.

As to Applicants' clarifying statements regarding the free particles, fixed particles, individual particles, substrate particles, and temperature control particles, Applicants comment as follows. The individual particles and the substrate particles are respectively a set of atoms, molecules, and other mass points, which, for example, represent a set of atoms by one mass point. The fixed particle, temperature control particle, and the

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free particle are a complement set of the substrate particle. They are not sub-atomic particles.

The Examiner's rejection of claims 4, 7, 13, 14, 15, 18, 19, and 22 is flawed in that he relies upon his own personal experience in rejecting these claims. For example, with respect to claim 18 and the display unit recited therein, the Examiner states in paragraph 38 of the Official Action that **"this is the standard in the art; I have seen this type of display at conferences . . . ."** It makes no difference what the Examiner has personally experienced if it does not qualify as prior art. Applicants traverse all such rejections of the claims noted above, the rejections of which are at least partially grounded on the Examiner's personal knowledge. That is, the Examiner is in effect stating that some of the claim limitations are well known in the art, without supplying a reference to back up his assertions. Instead, he supplies statements based on his personal knowledge such as the one quoted above. This is not acceptable to the Applicants, as the Examiner's personal knowledge may well be flawed and his memory inaccurate. Thus, Applicants demand that the Examiner supply references or a declaration that supplies relevant dates and places so that Applicant can make the determination whether the Examiner is truly relying on prior art or whether the Examiner is relying upon "smoke and mirrors" to set forth a basis for rejecting the above claims.

Moreover, the Examiner believes that features recited in claims 1, 4, 5, 6, 7, 8, 9, 11, 13, 14, 16, 18, 22, 23, 24, 27, 29, 30, and 31 are inherent in the cited art.

Applicants reply as follows.

Concerning claims 1, 5, 16, 24, and 25, the kinetic condition setting unit and the particle motion computing unit are perhaps generally equipped with a conventional particle simulator. However, the present invention is far from a conventional particle simulator. The present invention is specialized to treat the system where the number of particles rises during the simulation by generating the particles. The kinetic condition setting unit, which sets information for defining a plurality of generation periods and a

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corresponding number of particles to be generated during each generation is central to the present invention. This setting manner is flexible to various phenomena and is not easily obtained from the cited art. Also, the particle motion computing unit, which generates the particles in accordance with the information set by the kinetic condition setting unit and computes motion of the generated particle, is novel to the present invention.

With respect to claims 6, 8, 29, 30, and 31, the feature that the user can select whether each atom is stationary against the center of mass of particles, such as a molecule or cluster, is novel to the present invention. This feature is used, for example, to control the orientation of the molecules against the substrate artificially when they are adsorbed on the substrate surface. Such a feature is not taught or suggested in either reference relied upon by the Examiner. As recited in these claims, when each atom is not stationary against the center of mass, the molecules are provided a random orientation. This is not at all inherent in particle simulators as repeatedly asserted by the Examiner. Popular textbooks on the subject offer no such teaching.

With respect to claims 4, 7, 11, 13, 14, 18, 19, and 28, the Examiner again asserts that the claimed display is inherent in particle simulators in general. The display is believed to be novel to the claimed invention as it is used in combination with the kinetic condition setting unit, which, as has been explained above, is novel to the present invention.

As to claim 22, the Examiner fails to cite a reference that provides a description of how to specify an emission source.

As to claim 23, the features recited therein are not inherent in the cited art. Rather, these features are not obvious thereover.

The feature recited in claim 27, that of the particle motion computing unit generating the fixed particle, the temperature control particle, and the free particle, this feature is neither taught nor suggested by the prior art cited by the Examiner.

Thus, the invention recited in claims 1-32 is believed to be fully patentable over the cited art, and withdrawal of the Section 103 rejection is respectfully requested.

**Serial No.: 08/889,440****Docket No.: 21.1837/HBW****Conclusion**

In accordance with the foregoing it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot. All pending claims patentably distinguish over the prior art, taken in any proper combination. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited.

If any further fees are due by the filing of this Amendment, please charge same to deposit account No. 19-3935.

**Request for Interview**

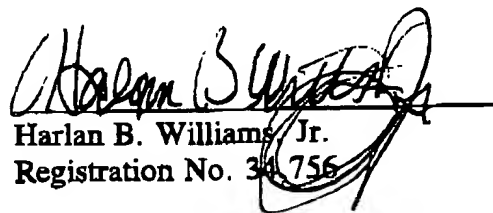
Should any issues remain unresolved it is respectfully requested that the Examiner contact the undersigned prior to issuing a further action so that a personal or telephonic interview can be scheduled so as to expedite and complete prosecution.

Respectfully submitted,

STAAS & HALSEY

Date: February 9, 1999

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